

YKHC Antibiotic Stewardship 2016

- Community Acquired Pneumonia
- Cellulitis
- Otitis Media
- Sinusitis
- Bronchitis
- UTI
- Review of 2015 Antibiogram

Why Antibiotic Stewardship at YKHC?

Widespread use leads to resistance

Antibiotics are a growing expense

Adverse drug effects and interactions are common

Clostridium difficile infection is on the rise

YKHC Guidelines are a great resource for proper treatment of common infections

Antibiotic Stewardship Committee is actively working to improve use of antibiotics at YKHC.

- Working on policies

- Collaborating with statewide groups in stewardship- ANMC and others

Community Acquired Pneumonia

- HCAP vs. CAP
- HCAP if IV therapy, wound care, or IV chemotherapy in prior 30 days or
- Long term care residence or
- Acute hospitalization for >2 days in prior 90 days or
- Attendance in a hospital or hemodialysis center in the prior 30 days
- CAP if none of the risks present

Outpatient vs. Inpatient treatment

- Pneumonia Severity Index (PSI) <70
- CURB65 <2
- Others
- PSI is in our guidelines and is scored based on age, vital signs, and lab data
- If higher risk, >70-90, or need for oxygen: hospitalize
- If lower risk: trial of outpatient therapy and reevaluate 48-72 hours
- Risk calculators also help determine who needs ICU therapy

Diagnostic testing

- CXR. Consider repeat if negative in 48 hours if hospitalized with strong suspicion of pneumonia after starting empiric therapy
- Other diagnostic studies useful for sicker patients and to determine how ill a patient is.
- May be optional in low risk patients treated as outpatients
- Chemistry, CBC, CRP, lactate
- Identification of causative agent
 - Blood, sputum and pleural fluid gm stain and culture
 - Urinary antigens
 - PCR of NP and sputum specimens
 - Serology

Empiric Outpatient Therapy

- Atypical agents most common along with viruses.
- Strep. pneumoniae
- First line: no abx exposure, pneumococcal resistance to macrolides <25%
 - Macrolide or Doxycycline
 - At YKHC S.pneumo 85% and 92% sensitive respectively
 - Consider amoxicillin in low risk patients in areas of high macrolide resistance. Switch to macrolide if failure to respond in 2 days to cover atypicals.
 - Chronic lung disease patients have more Moraxella and H.flu which have increasing beta-lactamase production. Consider amox/clavulanate
 - More severe comorbidities: treat with respiratory fluoroquinolone or beta-lactam plus macrolide

Empiric Therapy in Hospitalized Patients

- Non ICU patients:
 - Respiratory fluoroquinolone 750 mg or
 - Antipseudomonal beta-lactam (ceftriaxone, cefotaxime, amp/sulbactam) plus macrolide
 - Reevaluate in 48 hours.
 - Correct diagnosis?
 - Culture results?
 - Clinical response?
 - Narrow therapy to fit sensitivity when agent known
 - Switch to po antibiotic when hemodynamically stable, clinically improving, and able to ingest po

ICU Patients

- Antipseudomonal beta-lactam plus azithromycin or
- Antipseudomonal beta-lactam plus respiratory fluoroquinolone or
- Respiratory fluoroquinolone plus Aztreonam in pen allergic patients
- Consider Vancomycin in patients suspected of MRSA or septic.

Duration of Therapy

- Numerous studies and no consensus
- Several studies show similar outcomes - no difference in shorter vs longer duration of therapy.
- Ampicillin IV 3 days with or without 5 days of po amoxicillin
- Azithromycin 3 vs 5 days
- Fluoroquinolones 5 - 7 days
- Duration should depend to some degree on severity of illness, comorbidity, and presence of bacteremia

Pediatric Pneumonia

- ▶ Most common cause in all age groups: viruses (especially RSV in <5 years)
- ▶ Most common bacterial causes:
 - ▶ *Strep pneumo*, *Strep pneumo*, *Strep pneumo*
 - ▶ Much less common: *Haemophilus influenzae*, *Staph aureus*, *Mycoplasma pneumoniae*, *Chlamydia pneumoniae*
 - ▶ Oral anaerobes in our population

Treatment for 10 days

1st line: amoxicillin 45 mg/kg/dose PO BID

2nd line: Augmentin 45 mg/kg/dose PO BID

3rd line: cefdinir 7 mg/kg/dose PO BID

Treatment

1st line: ampicillin 50 mg/kg/dose IV Q6h

2nd line: Unasyn 50 mg/kg/dose IV Q6h

3rd line: ceftriaxone 75 mg/kg/dose IV Q24h

For PCN allergy: If reaction was non-anaphylactic, may trial amoxicillin with monitoring. If reaction was anaphylaxis, treat with a cephalosporin. If any questions, please obtain a pediatrics consult.

Azithromycin: Do not prescribe azithromycin unless there is evidence of an atypical pathogen and child is >5 years.

RUL infiltrate: consider starting with Augmentin/Unasyn to cover for oral anaerobes.

Cellulitis

- Redness, warmth, edema and pain. If exudative more likely Staph
- Non exudative cellulitis caused by beta hemolytic Strep or Staph
- Erysipelas is more superficial in the dermis and usually caused by beta hemolytic Strep.
- MRSA increasing. 53% of Staph isolates in YK Delta.
- Non exudative cellulitis is empirically treated as there is nothing to culture

Oral vs. Parenteral Therapy

- If mild without systemic toxicity 48-72 hour trial of oral therapy
- Abx choice depends on MRSA risk
- If MRSA not likely and no exudate treat with dicloxacillin, cefadroxil, cephalexin, or clindamycin. Generally cephalexin.
- If inadequate response may switch to clindamycin, amoxicillin and TMP/SMZ or doxycycline
- If exudative cellulitis w/o abscess treat with clindamycin, TMP/SMZ, or doxy.
- YKHC MRSA 98%, 100% and 97% sensitive respectively
- Deepening of erythema common in early therapy d/t enzyme release from pathogens triggering increased inflammation. Not a treatment failure.
- If systemic toxicity exists or develops on abx consider parenteral therapy

- If no MRSA risks identified (not a resident of the YK Delta!) may consider nafcillin, oxacillin, clindamycin, or cefazolin
 - If not responding, purulent exudate present, or has MRSA risks then Vancomycin should be used
 - Non purulent cellulitis more likely beta hemolytic Strep or MSSA
-
- If not responding in 72 hours consider addition of amp/sulbactam or ertapenem to cover gram negatives.
 - If pseudomonas is a risk (LTC, chemo, or immunosuppression) consider adding antipseudomonal regimen. Cefepime, ceftazidime, pip/tazo, or a carbapenem.

Abscesses

- Abscesses should be drained and cultured
- If <2cm may not need antibiotics.
 - If multiple lesions, larger, or more cellulitis surrounding, antibiotics are appropriate
 - Use MRSA active agents first line.
 - TMP/SMZ, doxycycline, clindamycin if outpatient
 - Vancomycin or clindamycin if inpatient
- Duration of therapy is 7-10 days depending on how ill and how well they respond.

Sinusitis and Bronchitis

Adam Vorke PharmD, BCPS,
Calley Paulson PharmD-To-Be

Sinusitis - Diagnosis

Duration 0-4 weeks - **Acute**-Virus

- Allergies
- Anatomical Defect
- Smoking

- *S. pneumoniae*
- *H. influenzae*

Duration 4- 12 weeks - **Sub-Acute** - *S. pneumoniae*

Duration > 12 weeks - **Chronic** - *H. influenzae*

- *M. catarrhalis*
- Virus



98%

2%

Sinusitis - Guidelines

Chow AW et al: IDSA clinical practice guideline for acute bacterial rhinosinusitis in children and adults. *Clin Infect Dis* 54:e72, 2012

Rosenfeld RM et al: Clinical practice guideline (update): Adult Sinusitis Executive Summary. *Otolaryngol Head Neck Surg* 152:598, 2015

Rudmik L, Soler ZM: Medical Therapies for Adult Chronic Sinusitis: A Systematic Review. *JAMA* 314:926, 2015

IDSA Guidelines (2012)

Bacterial vs. Viral:

- 1- **Persistent symptoms of acute rhinosinusitis lasting ≥ 10 days without ANY evidence of clinical improvement**
- 2- **Severe symptoms and signs with fever $> 102^{\circ}\text{F}$ and $> 3-4$ consecutive days of purulent nasal discharge and facial pain**
- 3- **Double sickening: worsening symptoms (nasal discharge, fever, headache) following a 5-6 day viral URI that was previously improving**

Table 3. Meta-analyses of Antibiotic Treatment Versus Placebo in Patients With Acute Rhinosinusitis

Patient Population	No. of Studies	No. Cured or Improved/No. Enrolled (%)		OR (95% CI)	No. Needed to Treat (95% CI) ^a
		Antibiotic	Placebo		
Adults [45, 46, 47–60]	17	1213/1665 (72.9)	989/1521 (65.0)	1.44 (1.24–1.68)	13 (9–22)
Children [61, 62, 63, 64] ^b	3	151/192 (78.5)	70/118 (59.7)	2.52 (1.52–4.18)	5 (4–15)

Abbreviations: CI, confidence interval; OR, odds ratio.

^a Calculated by inverting the difference from proportions of success rates between treatment groups [18].

^b Study by Kristo et al [63] was excluded due to inadequate inclusion criteria and antimicrobial dosing regimen.

***NNT: 13**

13 adult patients need to be treated with antibiotics before 1 single patient shows clinical improvement (i.e. 12 patients who received antibiotics show no benefit)

IDSA Guidelines (2012)

First Line for Bacterial Sinusitis:

Adults: Amoxicillin/Clavulanate 875/125mg PO BID x 7 days

▶ ALT: Doxycycline 100mg PO BID x 7 days

Children: Amoxicillin/Clavulanate 45mg/kg PO BID x 7 days

*Augmentin improves coverage for both *H. influenzae* and *M. catarrhalis*

American Academy of Otolaryngology (2015)

First distinguish between acute vs. chronic, infectious vs. non-infectious, and bacterial vs. viral sinusitis.

Bacterial Sinusitis: First line - **Watchful Waiting**

Second Line: Amoxicillin 500mg PO TID x 5-10 days or Augmentin 875/125mg PO BID x 5-10 days

(At YKHC *S. Pneumoniae* 95% susceptible to Amoxicillin)

Adjunct therapy:

- ▶ Symptomatic Relief:
 - ▶ Saline irrigation, nasal corticosteroids, analgesics
- ▶ Consider allergy testing

Medical Therapies for Adult Chronic Sinusitis: A Systematic Review (2015) -JAMA

First Line: High Volume Saline Irrigation & Nasal Corticosteroids

- ▶ **Second Line: Systemic Corticosteroids**
- ▶ **Third Line: Doxycycline 100mg PO BID x 21 days**
- ▶ **Fourth Line:**
 - ▶ Nasal polyps present: Montelukast (Singulair) 10mg PO QHS
 - ▶ No nasal polyps present: Azithromycin 3 month course

Sinusitis - Summary

- ▶ Only **2%** of ALL sinusitis infections are **bacterial** in etiology
- ▶ Best evidence supports patient supportive care with frequent saline nasal flushes, nasal steroids, and analgesics
- ▶ Differentiating between acute vs. chronic sinusitis key for antibiotic selection
- ▶ **Only use antibiotics when appropriate!**

Acute Bronchitis - Diagnosis

- ▶ Cough is the predominant complaint for upper respiratory tract infection (URTI)
 - ▶ Cough may be productive or non-productive; sputum may be clear or purulent
- ▶ Fever uncommon, but possible
 - ▶ Likely due to influenza, rhinovirus, coronavirus, metapneumovirus, or parainfluenza infection.
- ▶ Lung exam may reveal rhonchi (like snoring) or wheezing, but no crackles or evidence of lung consolidation

Acute Bronchitis - Differential Dx

- ▶ GERD
- ▶ Asthma Exacerbation
- ▶ Allergies w/ post-nasal drip
- ▶ CHF
- ▶ ACE Inhibitor Cough
- ▶ PNA
- ▶ Neoplasm

Acute Bronchitis Common Pathogens

- ▶ Rhinovirus
- ▶ Parainfluenza virus
- ▶ Coronavirus
- ▶ RSV
- ▶ Metapneumovirus
- ▶ Influenza virus
- ▶ *Chlamydophila pneumoniae* (rare)
- ▶ *Mycoplasma pneumoniae* (rare)
- ▶ *Bordetella pertussis* (rare)

Acute Bronchitis

“Viral respiratory tract infections are the major cause of antibiotic abuse in the US and most of Europe”

-Johns Hopkins Antibiotic Guide

Acute Bronchitis - Guidelines

Gonzales R et al: Principles of appropriate antibiotic use for treatment of uncomplicated acute bronchitis: background. *Ann Intern Med* 134:521, 2001

Woodhead M et al: Guidelines for the management of adult lower respiratory tract infections - full version. *Clin Microbiol Infect.* 17 Suppl 6:E1, 2011

CDC/ACP/ASIM Guidelines

Most common pathogens: Viral

Bacterial pathogens rare, only *B. pertussis* requires antibiotics

Use chest x-ray to r/o PNA when vitals are abnormal

Examined 8 clinical trials where abx given for acute bronchitis →

100% showed **NO BENEFIT**

Influenza Treatment:

Adult: Oseltamavir 75mg PO Q12H x 5 days

Children: Differs based on both age and weight

Call your friendly neighborhood pharmacist!

B. Pertussis Treatment:

Adults: Azithromycin 500mg PO Day1, then 250mg PO Days 2-5 or Erythromycin 500mg PO QID x 14 days

Children: Azithromycin 10mg/kg PO Day 1, 5mg/kg PO Days 2-5

European Respiratory Society and European Society for Clinical Microbiology and Infectious Diseases Guidelines

Acute Bronchitis:

- ▶ An acute illness, occurring in a patient without chronic lung disease, with symptoms including cough, which may or may not be productive and associated with other symptoms or clinical signs that suggest LRTI and no alternative explanation (e.g. sinusitis or asthma).

“There is one new update of a Cochrane review on the effects of antibiotics in acute bronchitis, including one large new trial on the effects of antimicrobial therapy: no new conclusions on the overall effects on the average adult patient with acute bronchitis”

European Respiratory Society and European Society for Clinical Microbiology and Infectious Diseases Guidelines

When To Use Antivirals:

- ▶ The empirical use of antiviral treatment in patients suspected of having influenza is usually not recommended
- ▶ Only in high-risk patients who have typical influenza symptoms (fever, muscle ache, general malaise and respiratory tract infection), for <2 days and during a known influenza epidemic, can antiviral treatment can be considered

European Respiratory Society and European Society for Clinical Microbiology and Infectious Diseases Guidelines

When To Use Antibiotics:

- ▶ Antibiotic treatment should be prescribed in patients with suspected or definite pneumonia
- ▶ Antibiotic treatment should be considered for patients with LRTI and serious co-morbidity such as
 - ▶ Selected exacerbations of COPD
 - ▶ CHF
 - ▶ Insulin Dependant Diabetes Mellitus
 - ▶ Serious neurologic disorder (ie stroke)

Acute Bronchitis - New Research

Smith SM et al: Antibiotics for acute bronchitis. *Cochrane Database Syst Rev* 3:, 2014

- ▶ A review of 17 studies including 3936 participants
- ▶ No significant difference in participant description of clinical improvement (subjective) between abx groups and placebo groups
- ▶ *Note NNT: 22

*“There is **limited evidence to support the use of antibiotics in acute bronchitis.** Antibiotics may have a modest beneficial effect in some patients such as frail, elderly people with multimorbidity who may not have been included in trials to date. However, the magnitude of this benefit needs to be considered in the broader context of potential side effects, medicalisation for a self-limiting condition, increased resistance to respiratory pathogens and cost of antibiotic treatment”*

Barriers to Antibiotic Stewardship

- ▶ Patient expectations
 - ▶ Education and reassurance
 - ▶ Non-pharmacological therapies
 - ▶ OTC Therapies (Saline flushes, Vicks Vapor Rub)
- ▶ Desire to help - non-maleficence first!
- ▶ Concerns due to lack of follow up for rural patient

References

John Bartlett MD. Sinusitis, Acute. *Johns Hopkins Antibiotic Guide*. Oct 4, 2015.

John Bartlett MD. Bronchitis, Acute, Uncomplicated. *Johns Hopkins Antibiotic Guide*. Nov 6, 2015.

Chow AW et al: IDSA clinical practice guideline for acute bacterial rhinosinusitis in children and adults. *Clin Infect Dis* 54:e72, 2012

Rosenfeld RM et al: Clinical practice guideline (update): Adult Sinusitis Executive Summary. *Otolaryngol Head Neck Surg* 152:598, 2015

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Gonzales R et al: Principles of appropriate antibiotic use for treatment of uncomplicated acute bronchitis: background. *Ann Intern Med* 134:521, 2001

Woodhead M et al: Guidelines for the management of adult lower respiratory tract infections--full version. *Clin Microbiol Infect* 17 Suppl 6:E1, 2011

Smith SM et al: Antibiotics for acute bronchitis. *Cochrane Database Syst Rev* 3:, 2014

Otitis Media: Most Common Pathogens

- ▶ *Streptococcus pneumoniae* (~50%)
- ▶ Non-typeable *Haemophilus influenzae* (~45%)
- ▶ *Moraxella catarrhalis* (~10%)
- ▶ Other: GAS, *Staph*, anaerobes (*Pseudomonas*)
- ▶ Viruses: RSV, rhinovirus, enterovirus, coronaviruses, flu, adenovirus, HMPV

Who to treat?

- ▶ All children with severe AOM - unilateral or bilateral
 - ▶ moderate-to-severe otalgia
 - ▶ fever $\geq 39^{\circ}\text{C}$ (102.2°F)
- ▶ Children younger than 24 months with BILATERAL nonsevere AOM
 - ▶ mild otalgia
 - ▶ temperature $< 39^{\circ}\text{C}$ (102.2°F)

Watch and Wait

- ▶ Children younger than 24 months with UNILATERAL nonsevere AOM
 - ▶ mild otalgia
 - ▶ temperature < 39°C (102.2°F)
- ▶ Children older than 2 years with nonsevere AOM - unilateral or bilateral
 - ▶ mild otalgia
 - ▶ temperature < 39°C (102.2°F)

Treat vs Watch and Wait

TABLE 4 Recommendations for Initial Management for Uncomplicated AOM^a

Age	Otorrhea With AOM ^a	Unilateral or Bilateral AOM ^a With Severe Symptoms ^b	Bilateral AOM ^a Without Otorrhea	Unilateral AOM ^a Without Otorrhea
6 mo to 2 y	Antibiotic therapy	Antibiotic therapy	Antibiotic therapy	Antibiotic therapy or additional observation
≥2 y	Antibiotic therapy	Antibiotic therapy	Antibiotic therapy or additional observation	Antibiotic therapy or additional observation ^c

^a Applies only to children with well-documented AOM with high certainty of diagnosis (see Diagnosis section).

^b A toxic-appearing child, persistent otalgia more than 48 h, temperature $\geq 38^{\circ}\text{C}$ (102.2°F) in the past 48 h, or if there is uncertain access to follow-up after the visit.

^c This plan of initial management provides an opportunity for shared decision-making with the child's family for those categories appropriate for additional observation. If observation is offered, a mechanism must be in place to ensure follow-up and begin antibiotics if the child worsens or fails to improve within 48 to 72 h of AOM onset.

Watch and Wait

- ▶ MUST have mechanism in place to provide treatment in 48-72 hours if needed.
- ▶ WILL NOT increase complications if there is appropriate follow-up.
- ▶ Reduces multidrug resistant organisms.

- ▶ NOTE: continue to provide pain control in this group.

Otitis Media: Treatment

Table 3: AOM Treatment

1st line: amoxicillin 45 mg/kg/dose PO BID for 10 days

2nd line: Augmentin 45 mg/kg/dose PO BID for 10 days

3rd line: cefdinir 7 mg/kg/dose PO BID for 10 days

4th line: ceftriaxone 75 mg/kg IV/IM QD for 3 days

Otitis-conjunctivitis syndrome

Augmentin 45 mg/kg/dose PO BID for 10 days

Try to avoid using cephalosporins. They are less effective at treating the most common organisms that cause OM. Additionally, cefdinir takes 3-5 days to reach the villages.

For PCN allergy: Please obtain a pediatrics consult.

For ruptured TM/tube drainage:

Wick ears prior to giving drops.

Ofloxacin 3-5 drops BID x10 days

Ciprodex 3-5 drops BID x10 days

Urinary Tract Infections

Nick Berres Pharm D

Asymptomatic Bacteriuria¹

▶ Definition

- ▶ Women: 2 consecutive voided urine specimens with the same bacteria strain with $\geq 100,000$ cfu/ml
- ▶ Men: Single clean-catch specimen with 1 bacterial species isolated with $\geq 100,000$ cfu/ml
- ▶ Catheterized patients: single specimen with 1 bacterial species isolated with ≥ 100 cfu/ml

Asymptomatic Bacteriuria¹

- ▶ Pyuria: evidence of inflammation in the genitourinary tract and is common in subjects with asymptomatic bacteriuria
 - ▶ ~32% young women
 - ▶ 30-70% in pregnant patients
 - ▶ 70% in diabetic women
 - ▶ 90% elderly institutionalized patients
 - ▶ 90% hemodialysis patients
 - ▶ 30-75% short term catheterized patients
 - ▶ 50-100% of long term catheterized patients
- ▶ The presence or absence of pyuria does not differentiate symptomatic from asymptomatic UTI

Asymptomatic Bacteriuria¹

▶ Microbiology

▶ Women

▶ Escherichia coli

- ▶ Klebsiella pneumoniae, coagulase negative staphylococci, Group B streptococci, Gardnerella vaginalis

▶ Men

- ▶ Coagulase negative staph, gram negative bacilli, enterococcus species

▶ Others

- ▶ Proteus mirabilis, Pseudomonas aeruginosa, Proteus mirabilis, Providencia stuartii, Morganella morganni

Asymptomatic Bacteriuria¹

Screening and Treatment

▶ Premenopausal Nonpregnant Women

- ▶ Treatment does not decrease the frequency of symptomatic infection or prevent further episodes of asymptomatic bacteriuria

▶ Pregnant Women

- ▶ Screening at least once in early pregnancy and treatment with 3-7 days of therapy if results are positive
- ▶ Periodic screening for recurrent bacteriuria should occur after completion of therapy

▶ Diabetic Women

- ▶ Screening or treatment of symptomatic bacteriuria in diabetic women is not indicated

Asymptomatic Bacteriuria¹

Screening and Treatment

- ▶ Elderly in the community
 - ▶ Routine screening and treatment of asymptomatic bacteriuria of elderly residing in the community is not recommended
- ▶ Elderly in an institution
 - ▶ Routine screening and treatment of asymptomatic bacteriuria of elderly residing in long term facilities is not recommended

Asymptomatic Bacteriuria¹

Summary

- ▶ Pregnant women should be screened for bacteriuria and treated if cultures are positive
- ▶ For all other adult populations asymptomatic bacteriuria has not been shown to be harmful.
- ▶ Asymptomatic bacteriuria does increase the risk of symptomatic urinary infection, treatment of asymptomatic bacteriuria does not decrease the frequency of symptomatic infection or improve other outcomes

Urinary Tract Infections²

- ▶ Uncomplicated: infection of a structurally and functionally normal urinary tract
- ▶ Complicated: infection in patients with an abnormal structural or functional urinary tract, or both
 - ▶ Functional abnormalities: ex. Obstruction, urolithiasis, pregnancy, neurogenic bladder
 - ▶ Congenital abnormalities: ex. Tumor, polycystic kidney disease, ureteric and urethral strictures
 - ▶ Foreign bodies: ex. Catheters
 - ▶ Other: ex. diabetes, renal failure, immunosuppression, male

Microbiology

- ▶ Escherichia coli
- ▶ Klebsiella
- ▶ Enterobacter spp

Other sources

- ▶ Proteus
- ▶ Pseudomonas
- ▶ Citrobacter
- ▶ Staphylococcus
- ▶ Group B streptococcus

~90% of all urinary tract infections



Rising Resistance

Table 1. Annual Rates of Resistance in Urinary *Escherichia coli* Isolates to Select Antimicrobials Among Outpatient Women of Childbearing Age (16–45 y), 2000–2010

Drug	Total isolates 2000–2010	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total change 2000–2010 ^a
TMP-SMX	667 648	17.5	16.9	16.7	17	17.3	17.7	18.3	18.8	19.7	19.6	20.8	3.3
Ciprofloxacin	592 555	1.2	1.4	1.9	2.4	2.9	4.1	5.4	6.2	7.2	7	7.1	5.9
Nitrofurantoin	646 516	0.5	0.5	0.5	0.5	0.4	0.4	0.6	0.6	0.6	0.6	0.5	0
Amox-Clav	255 728	3.7	3.3	4.3	3.6	3	3.6	4.7	6.7	7.6	4.4	4	0.3
Ampicillin	657 246	39.7	38.9	38.8	38.4	37.4	38	38.8	39	39.6	39.6	40.2	0.5
Cephalothin	170 561	12	14.1	12.5	12	11.5	14.9	15.3	13.4	12.8	11.7	12.2	0.2

Sanchez et al, CID 2011; Letter to Editor in response to UTI GL

Acute Uncomplicated Cystitis²

Treatment

Drug	Dose/Frequency	Duration
Nitrofurantoin	100 mg BID	5 days
Cephalexin	500 mg BID	7 days
Cefodoxime	100 mg BID	7 days
Augmentin	875/125mg BID	7 day
Ciprofloxacin	250mg BID	3 day
Levofloxacin	250 mg Daily	3 days
TMP/SMX	DS (160/800mg) BID	3 days

- ▶ +Assuming normal renal function
- ▶ Green = guideline endorsed therapy with high rates of susceptibility
- ▶ Yellow = 2nd line therapy based on susceptibilities and/or side effects
- ▶ Red = Third line agent based on FDA recommendations (FQs) and resistance (SMX/TMP)

Acute Pyelonephritis²

Drug	Dose/Frequency	Duration
Ciprofloxacin	500 mg BID	7 days
Levofloxacin	750 mg Daily	5 days
Cephalexin	500 mg q 6 hours	14 days
Cephodoxime	200 gm BID	14 days
TMP/SMX	DS (160/800 mg) BID	14 days

*Urine culture and susceptibility should always be performed

+Assuming normal renal function

†Give initial long acting IV antibiotic (e.g. ceftriaxone 1g)

Green = guideline endorsed therapy with high rates of susceptibility

Yellow = 2nd line therapy based on susceptibilities and/or side effects

UTI During Pregnancy³

- ▶ Asymptomatic bacteriuria occurs in 2-7% of pregnant women
- ▶ Urinalysis is inaccurate and should not be used as a screening tool for bacteriuria during pregnancy
- ▶ Acute pyelonephritis will develop in ~25% of untreated bacteriuria in pregnant women
 - ▶ 3-4% of pregnant women treated for bacteriuria

UTI in Pregnancy³

Treatment

- ▶ Initial bacteriuria: 3 day course
 - ▶ Nitrofurantoin 100mg BID
 - ▶ Cephalexin 250mg q 6 hrs
 - ▶ Amoxicillin 500mg TID
- ▶ Longer courses can be considered for recurrent infections
- ▶ Women with frequent recurrent episodes of bacteriuria or UTI should consider prophylactic antibiotics for the remainder of pregnancy

References

1. Lindsay N, Bradley S, Colgan R, et al. Infectious diseases society of america guidelines for the diagnosis and treatment of asymptomatic bacteriuria in adults. Clin Infect Dis. 2005;40:643-54
2. Gupta K, Hooton T, Naber K, et al. International clinical practice guidelines for the treatment of acute uncomplicated cystitis and pyelonephritis in women. Clin Infect Dis. 2011;52(5)e103-e120
3. Gilstrap L, Ramin s. Urinary tract infections during pregnancy. Am J Obstet Gynecol. 2001;28:581-91